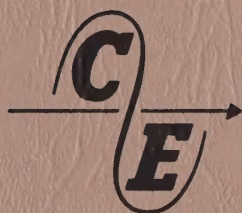


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**MODEL 304B
PRESELECTOR**



**CUSHMAN
ELECTRONICS, INC.**

830 Stewart Dr. • Sunnyvale, CA 94086
Telephone: Area Code 408-739-6760

MP MASTER

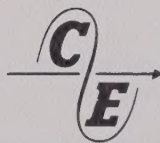


MA31749

MANUFACTURERS OF PRECISION ELECTRONIC INSTRUMENTS



**MODEL 304B
PRESELECTOR**



**CUSHMAN
ELECTRONICS, INC.**

830 Stewart Dr • Sunnyvale, CA 94086
Telephone: Area Code 408-739-6760

WARRANTY

CUSHMAN ELECTRONICS, INC. WARRANTS EACH OF THE INSTRUMENTS OF THEIR MANUFACTURE TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF ORIGINAL PURCHASE. THE FOREGOING IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS, IMPLIED OR STATUTORY. THE COMPANY, UNDER THEIR LIBERAL WARRANTY, WILL REPAIR OR REPLACE ANY INSTRUMENT FOUND DEFECTIVE.

THIS WARRANTY MAY NOT APPLY TO INSTRUMENTS WHICH, IN THE OPINION OF THE COMPANY, HAVE BEEN ALTERED OR MISUSED.

This manual is intended to give the user a comprehensive knowledge of the instrument and its operation or repair. In the event of trouble, study the manual carefully. Most instrument malfunctions can be corrected by the user with a minimum of lost usage time.

For assistance or information of any kind, contact the factory. Give full details of the nature of your problem and include the model and serial number of the instrument.

Should it appear that the instrument needs to be returned to the factory for service or recalibration, let us know. Shipping instructions will be promptly given to you. There will be no charge for repair on instruments within the one year warranty other than transportation costs after 90 days of ownership. Estimates of charges for non-warranty or any other service will be supplied by the factory upon request before work is begun and such work will be done on an actual cost basis only.

CLAIM FOR DAMAGE IN SHIPMENT

Your instrument should be inspected and tested as soon as it is received. The instrument is insured for safe delivery. If the instrument is damaged in any way or fails to operate properly, file a claim with the carrier or, if insured separately, with the insurance company.

.

*We sincerely pledge our immediate and fullest cooperation
to all users of our precision electronic instruments.*

PLEASE ADVISE US IF WE CAN ASSIST YOU IN ANY MANNER

CUSHMAN ELECTRONICS, INC.

830 Stewart Dr. ☐ Sunnyvale, Cal. 94086 ☐ 408—739-6760



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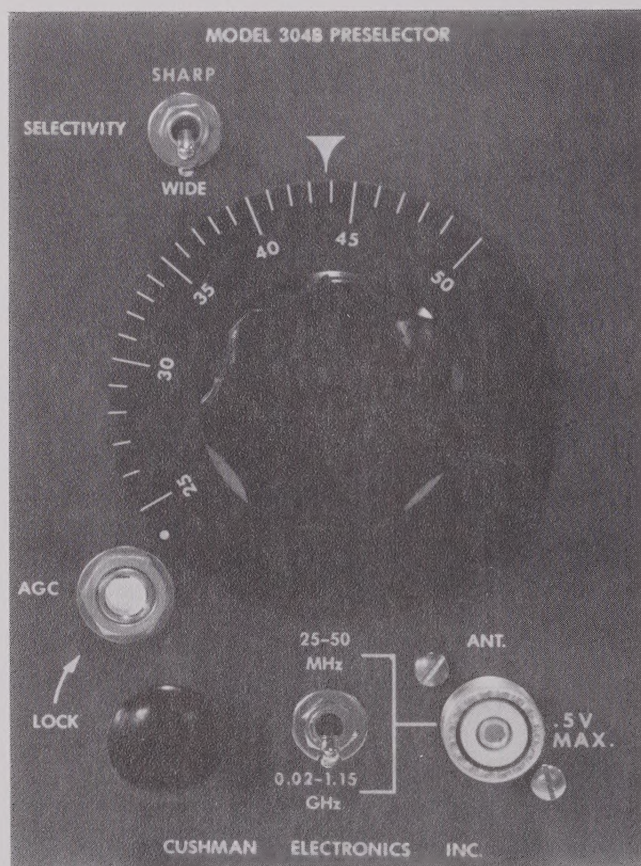


Figure 1-1. Model 304B Preselector

SECTION 1 GENERAL

DESCRIPTION

1.01 The Model 304B Preselector is an RF front end for the Cushman FM Communication Monitors. It provides high sensitivity over a tuneable frequency range of 25 to 50 MHz. It also provides a wide band coverage at a lower sensitivity over all the ranges to which the FM Communications Monitor may be tuned, both direct and harmonically related, within the overall band of .02 to 1.15 GHz

1.02 The Preselector plugs into the right hand panel opening in the FM Communications Monitor. All electrical connections required, except the RF input, are made through a plug on the rear panel of the Preselector which mates with a receptacle in the Monitor. The RF input, usually from an antenna, is connected to the Antenna Connector on the Preselector front panel.

1.03 The Preselector may also be used with the Cushman CE-2B FM Communications Monitor if a conversion kit has been installed. This kit, available from Cushman Electronics, provides all the parts and instructions necessary to make the conversion.

1.04 The sensitivity of the Preselector over its tuneable range is better than 20 microvolts, which allows monitoring of stations up to 50 miles away. In the Broadband mode the sensitivity is better than 10 mV below 520 MHz for in-band operation. For harmonically related frequencies the sensitivity will decrease proportionally with increasing harmonic order.

1.05 When the received signal is the same as the frequency dialed up on the Monitor the Preselector IF output will be 10 MHz. If the input frequency differs from the dialed up frequency the IF will also differ from 10 MHz by this amount and the meter on

the Monitor will indicate this difference. Thus any error in the transmitted frequency will be indicated on the Frequency meter on the Monitor.

1.06 A switch on the Preselector front panel permits the selection of either the Tuneable mode or the Broadband mode. In the Broadband mode the input is untuned and the input tuning circuits are disabled.

1.07 A SHARP/WIDE switch on the front panel permits the selection of either a crystal filter which reduces the bandwidth of the IF channel to minimize adjacent channel interference, or the normal bandwidth which provides full IF channel bandwidth.

1.08 An external DC voltmeter can be connected to the AGC jack to indicate relative signal strength and proper tuning. Because the AGC voltage is a function of the strength of the received signal, measuring and recording this voltage makes it possible to detect changes in the signal strength from a remote transmitter over extended periods.

1.09 The change in AGC voltage for a change in input signal strength is greatest when the received signal level is just above that required to turn on the Monitor SIGNAL LEVEL light. At this level a 3 dB signal level loss can be detected.

CAUTION

Signal levels in excess of 0.5 VAC may damage the input stage. When a transceiver is directly connected to the input the transmitter should NEVER be keyed.

SPECIFICATIONS

1.10 Specifications for the Model 304B are listed in Table A.

Table A. Specifications, Model 304B

ITEM	CHARACTERISTICS
FREQUENCY	
Range (Same as Monitor used)	
Not to exceed	
Preselector mode	25-50 MHz
Wide band mixer mode	0.02-1.15 GHz
SENSITIVITY	
Preselector mode	20 μ V
Wide band mixer mode	10mV
MAXIMUM INPUT SIGNAL LEVEL	0.5V
INPUT IMPEDANCE	50 Ω (Nominal)
SQUELCH OUTPUT	1V DC (Nominal) when IF output ≥ 60 mV RMS
OUTPUT FREQUENCY (IF to Monitor)	10 MHz
AGC VOLTAGE	
20 μ V RF Input	-3.3V DC (Nominal)
500mV RF Input	-6.5V DC (Nominal)
IF 3 dB BANDWIDTH	
SELECTIVITY, WIDE	65 kHz (Nominal)
SELECTIVITY, SHARP	22 kHz (Nominal)
IF 50 dB BANDWIDTH	
SELECTIVITY, WIDE	650 kHz (Nominal)
SELECTIVITY, SHARP	150 kHz (Nominal)
IMAGE REJECTION	
($F_{in} \pm 20$ MHz)	≥ 60 dB
POWER REQUIREMENTS	
Local Oscillator Signal	-20 dBm across 50 (obtained from Monitor)
DC Supply	+5, +20, -12V DC (obtained from Monitor)
DIMENSIONS	5 1/2" H 4"W 10" D
OPERATING TEMPERATURE	+10°F to +130°F

SECTION 2

OPERATING INSTRUCTIONS

GENERAL

- 2.01 The functions of the front panel controls and connectors shown in figure 1-1 are given in Table B.

NOTE

Although the Model 304B has been most carefully designed to eliminate the pick-up of interference, a powerful transmitter operating in the immediate vicinity of the instrument may make operation of the Preselector over its entire frequency range impossible, even with the SELECTIVITY switch in the SHARP position. To monitor effectively, operations should be suspended until the interfering transmitter leaves the air.

OPERATION WITH CE-3, CE-5, CE-6 or CE-7

- 2.02 Insert the Model 304B Preselector into the right hand opening in the Monitor front panel and turn the LOCK on the Preselector front panel clockwise until it is finger tight.
- 2.03 Connect a 50 ohm cable from the antenna to the Preselector ANT. connector.

NOTE

When the telescoping antenna furnished with the Monitor is used with the Preselector, the high sensitivity may result in pick up of sufficient radiation from the Monitor itself to light the SIGNAL LEVEL light. An external

antenna is therefore recommended when the Preselector is used.

- 2.04 (Optional) Connect a DC voltmeter (sensitivity at least 20,000 ohms per volt) to the AGC VOLTAGE jack and set the voltmeter to the lowest range that will accommodate a voltage swing of from -2 volts to -6 volts. Use of a voltmeter is a convenience, not a necessity.

- 2.05 Turn the Preselector SELECTIVITY switch to WIDE.

NOTE

When the SELECTIVITY switch is in the WIDE position, the maximum IF bandwidth is available to the Monitor. To reduce interference from adjacent channels this switch should be set to SHARP. In the SHARP position the IF bandwidth is narrowed to the extent that the absolute accuracy of the deviation displayed on the Deviation Meter or the Oscilloscope may be slightly degraded. Therefore the SHARP position should only be used when absolutely necessary.

- 2.06 Place the Monitor in the FREQ.-DEV. MEASURE mode and dial in the nominal frequency of the signal to be measured.
- 2.07 Place the Preselector bandwidth mode switch in the 25-50 MHz position.
- 2.08 Turn the Preselector tuning dial to the nominal frequency

of the signal to be measured. Carefully adjust this dial until a maximum reading is obtained on the voltmeter (connected in step 2.04). If a voltmeter is not used tune the Preselector until the Monitor SIGNAL LEVEL light just comes on.

2.09 Proceed with normal monitor operation as described in the appropriate Communications Monitor manual.

2.10 For Broadband operation place the bandwidth mode switch in the 0.02-1.15 GHz position and proceed according to the operating procedures given above, except that the Preselector input tuning circuit is now disabled.

OPERATION WITH CE-2B

2.11 Insert the Preselector into the cabinet furnished with the conversion kit. (It is assumed that the printed circuit board from the conversion kit has been installed in the CE-2B as directed in the instructions furnished with the kit.)

2.12 Connect one coaxial cable from the cabinet to the RF IN/SIG OUT connector on the CE-2B.

2.13 Connect the other cable from the cabinet to the accessory receptacle on the side of the CE-2B.

2.14 Proceed according to the instructions given in steps 2.03 to 2.10 except that in step 2.09 reference should be made to the CE-2B instruction manual.

Table B. 304B Controls and Connectors

Controls and Connectors	Schem. Ref.	Description	Function
SELECTIVITY SHARP WIDE	S1	Toggle switch	Restricts IF bandwidth to 22 kHz Selects normal IF bandwidth of 65 kHz
Bandwidth Mode	S2	Toggle switch	Selects either Tuneable mode or Broadband mode
Tuning Dial	C1B,D, F	Capacitors	Tunes the Preselector to the desired frequency in tuneable mode
ANT.	J1	UHF Female	50 ohm input connector
AGC VOLTAGE	J2	Phone jack	Connection to internal AGC voltage
LOCK		Thumb screw	Fastens Preselector securely to the Monitor
Plug (rear panel)	P1	24 pin connector	Interconnects power and signals between Preselector and Monitor
Plug (rear panel)	P2	BNC Male	LO connection between Preselector and Monitor

PREPARATION FOR RESHIPMENT

2.15 It is recommended that the shipping box and foam packaging be kept in case it becomes necessary to ship the instrument to the service point or factory for service or repair. (Contact Cushman Electronics Customer Service Department before returning an instrument.)

2.16 The following is a general guide for repackaging the instrument for shipment.

NOTE

If the instrument is to be shipped, attach a tag to the instrument identifying the owner and indicate the service or repair to be accomplished. Include the model number and full serial number of the instrument. In any correspondence, always identify the instrument by model number and serial number.

2.17 If the original container is to be used, proceed as follows:

(1) Place the instrument in the original container. (If the original container is not available, one can be purchased from Cushman Electronics.)

(2) Make sure that the container is well sealed with strong tape.

2.18 If the original container is not used, proceed as follows:

(1) Wrap the instrument in plas-

tic or heavy paper before placing in an inner container.

(2) Place packing material around all sides of the instrument.

(3) Place the instrument and inner container in a heavy carton or wooden box and seal with strong tape or metal bands.

(4) Mark the shipping container "DELICATE ELECTRONIC INSTRUMENT", "FRAGILE".

SERVICE OR REPAIR

2.19 In the event that factory service or repair seems to be required, contact the Cushman Electronics Customer Service Department for further service information or to make arrangements for shipment to the factory or to a Service Center. The factory address is:

Cushman Electronics, Inc.
Customer Service Department
830 Stewart Drive
Sunnyvale, California 94086
Telephone: (408) 739-6760

2.20 The service points for the 304B in the United States are:

BCS Associates, Inc.
940 North Fern Avenue
Orlando, Florida 32803
Telephone: (305) 843-1510

Reshal Associates
219 West University Drive
Arlington Heights, Illinois 60004
Telephone: (312) 398-7660

SECTION 3

THEORY OF OPERATION

FUNCTIONAL DESCRIPTION

3.01 The signal to be measured, from an antenna or other source, goes from the input connector directly to an electronic switch. There it is routed either to the tuned RF amplifier or to the wide band mixer, depending on the setting of the Bandwidth Mode switch. See Block Diagram figure 3-1.

3.02 In the Tuneable Narrow Band Mode, output from the RF amplifier is combined with the Local Oscillator signal from the FM Communications Monitor in the signal mixer to generate the IF output.

3.03 When used in the Wide Band Mode the tuned RF and tuned LO amplifiers are turned off. In this mode both the input signal and the LO from the Monitor are applied directly to the wide band mixer to generate the IF output.

3.04 In the WIDE position of the SELECTIVITY switch the mixer output signal passes directly through the IF amplifier to the Monitor. In the SHARP position the signal first goes through a crystal filter, which restricts the bandwidth to reduce interchannel interference, and then through the IF amplifier.

3.05 A portion of the IF amplifier output is amplified to operate the AGC circuit and the squelch circuit. AGC voltage is available at the Preselector front panel for operation of a tuning meter (external voltmeter) if desired. The squelch output operates the signal level detector circuits in the Monitor, which also control the SIGNAL LEVEL light on the Monitor front panel.

FREQUENCY RELATIONSHIPS WITH THE CE-3*

3.06 Table C summarizes the frequency relationships in the mixing process

when the 304B Preselector is used in the CE-3 Monitor. As an example, assume the transmitter to be monitored is assigned the frequency of 32.320 MHz. When this frequency is dialed in on the CE-3 the variable frequency output to the LO mixer in the 304B (f_v) will be 472.320 MHz. This must be equal to the sum of the CE-3 LO fixed frequency (f_f) plus the IF (f_{IF}) plus the input frequency (f_{in}) ($430 + 10 + 32.320$ MHz).

Table C. Frequency Relationships
Model 304B with CE-3

Dialed In Frequency (f_{in})		25-49,999
Local Oscillator Input	Fixed Freq. (f_f)	430
	Variable Frequency (f_v)	460-479,999
LO Mixer Output $f_{LO} = (f_v - f_f)$		30-49,999
Signal Mixer Output $f_{IF} = f_{LO} - f_{in} $		10,000
1. All frequencies are in MHz. 2. The last four digits of the dialed in frequency are the same as the last four digits of the LC variable frequency input.		

This variable frequency is combined in the LO mixer, CR1, with the fixed frequency output from the Monitor to produce the LO frequency to the signal mixer, Q3, of 42.320 MHz (472.320 - 430 MHz). If the transmitter is exactly on frequency these signals will mix to produce the 10 MHz IF (42.320-32.320 MHz) and the CE-3 FREQUENCY meter will indicate zero kHz. If the transmitter is 1 kHz high (32.321 MHz) the IF output will be 42.320 - 32.321 = 9.999 MHz instead of 10 MHz and the CE-3

Table D. Wide Band Mixing Frequencies

CE-3 Dialed In Frequency (f_{in})	LO Fixed Frequency (f_f)	LO Variable Frequency (f_v)	$f_{LO} = f_v - f_f$	$f_{out} = f_{in} - f_{LO}$
20.000- 29.999	430	460.000-469.999	30.000- 39.999	10.000
30.000- 39.999	430	470.000-479.999	40.000- 49.999	10.000
40.000- 49.999	430	460.000-469.999	30.000- 39.999	10.000
50.000- 59.999	430	470.000-479.999	40.000- 49.999	10.000
60.000- 69.999	430	480.000-489.999	50.000- 59.999	10.000
70.000- 79.999	430	490.000-499.999	60.000- 69.999	10.000
120.000-129.999	330	460.000-469.999	130.000-139.999	10.000
130.000-139.999	330	470.000-479.999	140.000-149.999	10.000
140.000-149.999	330	460.000-469.999	130.000-139.999	10.000
150.000-159.999	330	470.000-479.999	140.000-149.999	10.000
160.000-169.999	330	480.000-489.999	150.000-159.999	10.000
170.000-179.999	330	490.000-499.999	160.000-169.999	10.000
450.000-459.999	-	460.000-469.999	460.000-469.999	10.000
460.000-469.999	-	470.000-479.999	470.000-479.999	10.000
470.000-479.999	-	460.000-469.999	460.000-469.999	10.000
480.000-489.999	-	470.000-479.999	470.000-479.999	10.000
490.000-499.999	-	480.000-489.999	480.000-489.999	10.000
500.000-509.999	-	490.000-499.999	490.000-499.999	10.000
510.000-519.999	-	500.000-509.999	500.000-509.999	10.000
1. All frequencies are in MHz. 2. The last four digits of the dialed in frequency are the same as the last four digits of the LO variable frequency.				

FREQUENCY meter will indicate +1 kHz. The LO frequency is sometimes 10 MHz higher and sometimes 10 MHz lower than the input frequency according to the frequency dial setting pattern noted in paragraph 3.07.

3.07 Frequencies involved in mixing when the Wide Band Mode is used

are shown in Table D. When the first two frequency selector dials on the CE-3 read either 02, 03, 12, 13, 45 or 46 the LO is 10 MHz higher than the input frequency, otherwise it is 10 MHz lower. This change is taken care of in the CE-3 circuitry so that the front panel readings are always correct.

FREQUENCY RELATIONSHIPS WITH THE CE-2B

3.08 Table E summarizes the frequency relationships when the 304B is used with the CE-2B. (This assumes the modification kit has been installed in the CE-2B.) The LO frequency required by the Preselector is produced in the same way as in the CE-3 except that a 900 MHz fixed frequency is used. The LO is either 10 MHz higher or lower than the input signal as shown in Table C according to the frequency dial setting pattern noted in paragraph 3.07.

Table E. Frequency Relationships
Model 304B with CE-2B

Dialed In Frequency (f_{in})		25-49.999
Local Oscillator Input	Fixed Freq. (f_f)	900
	Variable Frequency (f_v)	930-949.999
LO Mixer Output $f_{LO} = (f_v - f_f)$		30-40.999
Signal Mixer Output $f_{IF} = f_{LO} - f_{in} $		10.000
1. All frequencies are in MHz. 2. The last four digits of the dialed in frequency are the same as the last four digits of the LO variable frequency input.		

FREQUENCY RELATIONSHIPS WITH THE CE-7

3.09 When the Preselector is used with the CE-7, the LO input is 10 MHz above the frequency being monitored when the input frequency is between 25 and 39.999 MHz and is 10 MHz below when the input frequency is between 40 and 49.999 MHz. This LO frequency is generated in the CE-7 by a crystal oscillator which operates with crystals having a

fundamental frequency between 6.2 and 9.4 MHz. A tuneable harmonic amplifier and a step-recovery diode harmonic generator raise this range to the required 30 to 49.9999 MHz.

CIRCUIT DESCRIPTION

3.10 The signal into the Preselector goes first to the electronic switch CR1, CR2. Either +20V or -12V is applied to these diodes through isolating resistor R2 to bias one on and the other off, according to the setting of the Band Mode switch, S2.

3.11 Band Mode switch, S2, also controls the power to the drains of the MOSFET's of the tuned RF amplifier and the transistors of the tuned LO amplifier and the bias to the wide band, LO and signal mixers. Power is applied to each circuit by the switch according to the mode of operation selected.

3.12 When the Band Mode switch, S2, is placed in the Tuneable Narrow Band mode the signal is switched to the input of the tuned RF amplifier, Q1, Q2, through CR1, power is connected to the tuned RF and LO amplifiers, the LO mixer, CR9, is biased on, the wide band mixer CR3 is biased off and Q3 is biased to function as a mixer. RF amplifier output is applied to the signal mixer, Q3, where it is combined with the LO frequency to produce the IF output.

3.13 The fixed and variable frequencies from the CE-3 enter the Preselector through P2 on the rear panel. They are combined in the LO mixer, CR9, to produce the LO frequency required at the signal mixer, as outlined in paragraph 3.06. This frequency is amplified in the tuned LO amplifier, Q8, Q9, Q10, Q11, and the output applied to the signal mixer, Q3. When a fixed frequency is not used the variable frequency passes through CR9 to the amplifier and signal mixer.

3.14 The IF output of the signal mixer

goes through electronic switch gates CR4, CR7 to the input of the IF amplifier, Q4, Q5, Q6, Q7 when the SELECTIVITY switch is in the WIDE position. In the SHARP position gates CR4, CR7 are closed and CR5, CR8 are opened to route the signal through the crystal band-pass filter, X1, and then through the IF amplifier. The crystal filter has a bandwidth of 22 kHz while the IF amplifier bandwidth is 65 kHz. The switch gates are controlled by switch S1, which applies -12V to close switches CR4, CR7 and +20V to close switches CR5, CR8. Resistors R17, R19, R21 present a high impedance to the signal path. CR6 closes a low impedance connection to ground between CR4, CR7, when they are off, to eliminate the possibility of signal feed through around the crystal filter.

3.15 The tuned circuit, L13, C34, C35 provides impedance matching between the output of the crystal filter and the input to the IF amplifier. L13 also provides the ground return path for control switching current through CR7 and CR8. Thermistor, R31, in the emitter circuit of Q5 is used for gain temperature compensation. The 10 MHz signal required in the Signal Generator and CAL mode is supplied by the CE-3 and applied to the base of Q6. Output from Q7 goes to the CE-3 Monitor and also to Q12 where it is amplified for use in the AGC and squelch circuits.

3.16 IF signal output from Q12 is rectified by CR10 to provide a DC input to the differential amplifier,

IC1, proportional to the input signal level. The DC output of IC1 is the AGC voltage for the tuned RF amplifier. This output is also made available at the front panel jack, J2, for use as a tuning indicator. In like manner, CR11 rectifies the IF signal to the input of IC2, which provides the squelch voltage to the CE-3 to operate the signal level detector circuits and the SIGNAL LEVEL light. R67 adjusts the AGC level and R81 adjusts the squelch level which controls the turn-on point of the SIGNAL LEVEL light on the CE-3.

3.17 When the Band Mode switch, S2, is placed in the Wide Band mode, switch CR2 is closed, CR1 is opened, and the wide band mixer CR3 is biased on. At the same time voltage is removed from the tuned RF and LO amplifiers, LO mixer CR9 is biased off and Q3 is biased to operate as an amplifier. The signal and LO frequency are now applied to the Wide Band mixer, CR3. Signal is applied through gate, CR2, coupling capacitors, C1, C2, C3, C4, and the 10 MHz reject filter, C5, L1. 10 MHz is bypassed to ground through the series tuned filter C9, L2. The LO signal is applied through coupling capacitors C6, C7. The coupling capacitors C1, C2, C3, C4, C6, C7, provide relatively equal coupling over the entire wide band range for both signal and LO frequencies. IF output from CR3 is connected to Q3, which is now functioning as an amplifier. The signal path from the output of Q3 through the IF channel is the same from this point on as in the Tuneable Narrow Band Mode.

* Operation with the CE-5 and CE-6 is similar to that described above although the frequency patterns used to achieve the same 10 MHz output are different, refer to appropriate Communications Monitor manual.

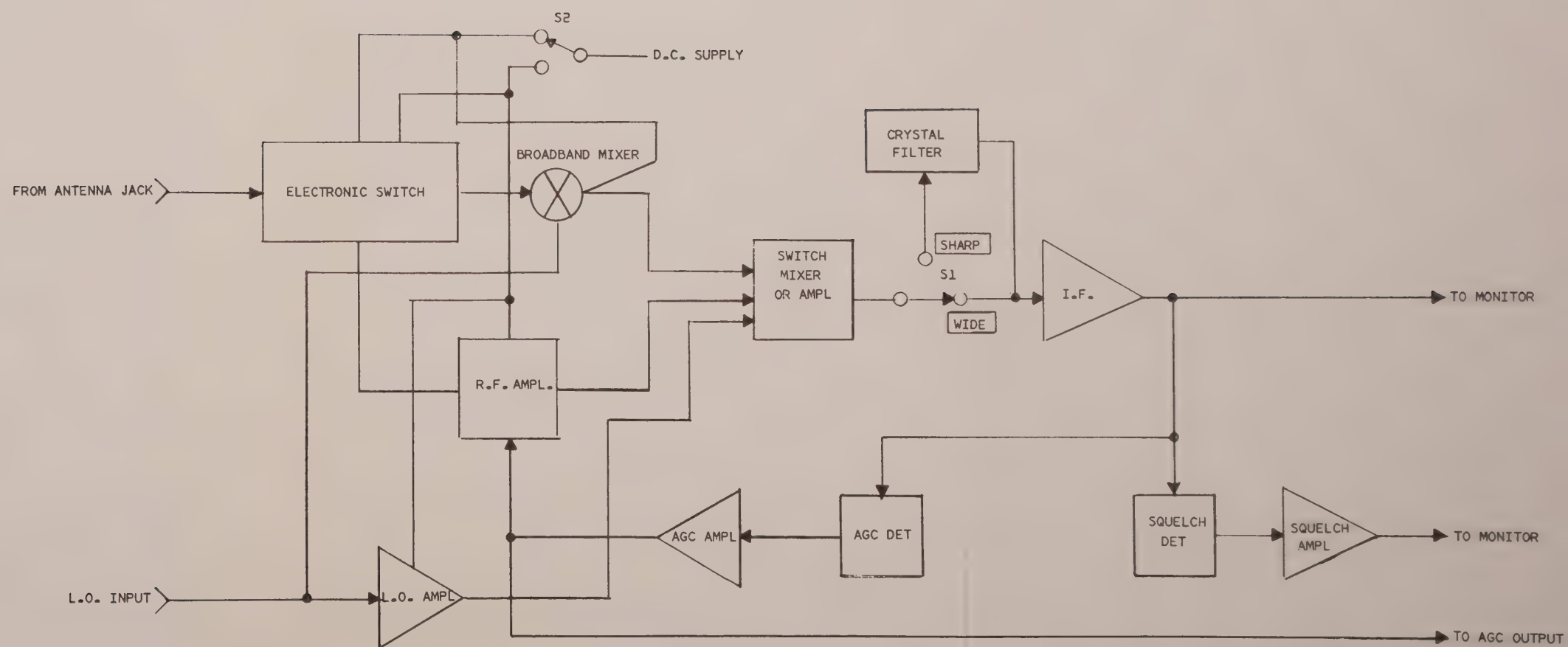


Figure 3-1. Model 304B Overall Block Diagram

SECTION 4 ADJUSTMENTS

EQUIPMENT REQUIRED

- 4.01 Use the following equipment or the equivalent.

Signal Generator HP608C
DC Voltmeter Simpson 270
RF Voltmeter Boonton 91D

AGC VOLTAGE ADJUSTMENT

- 4.02 To adjust the AGC, operate the Model 304B with one of the FM Communications Monitors and proceed as follows.

- a. Remove right side cover of Monitor.
- b. Connect the output of a signal generator to the ANT. connector of the Model 304B, and adjust the signal generator for an output of 100 millivolts at 32 MHz. When a CE-7 is the associated Monitor, select a frequency for which the CE-7 has been equipped with a crystal, preferably near 32 MHz and tune signal generator to that frequency.
- c. Turn the SELECTIVITY switch to WIDE.
- d. On the Monitor turn the function switch to **FREQ. - DEV. MEASURE** and dial up the frequency to which the signal generator was set in step b.
- e. Connect a DC voltmeter with a sensitivity of at least 20,000 ohms per volt to the AGC VOLTAGE jack and tune the Preselector for

maximum AGC voltage.

- f. Connect a high impedance RF voltmeter to pin 7 of the Preselector plug-in connector.
- g. Adjust the AGC control R67 (of the two adjustments, the control toward the front on top of the Preselector, see component identification drawing figure 5-1) until RF voltmeter reads 150 millivolts.

SIGNAL LEVEL LIGHT ADJUSTMENT

- 4.03 When the 304B is used with a CE-2B the signal level is predetermined by the attenuator board which was installed as part of the CE-2B conversion. R81 in the 304B will have no effect whatever.

- 4.04 Adjustment of the signal level in the other Monitors is performed as follows:

- a. Connect the output of a signal generator to the ANT. connector of the 304B and adjust the generator for a medium level output at a frequency of 32 MHz. When using the CE-7 select a frequency for which a crystal is available near 32 MHz and tune signal generator to that frequency.
- b. Set the SELECTIVITY switch on the 304B to WIDE.
- c. On the Monitor turn the function switch to **FREQ. - DEV. MEASURE** and dial up

the frequency to which the signal generator was set in step a.

d. Connect a DC voltmeter with a sensitivity of at least 20,000 ohms per volt to the AGC VOLTAGE jack and tune the Preselector for a maximum indication on the meter.

e. Adjust the signal generator level so that there is 60 millivolts at pin 7 of the plug-in connector, measured with

the high impedance RF voltmeter.

f. Make the adjustment using R81 (of the two adjustments, the control toward the rear on top of the Preselector, see component identification drawing figure 5-1).

g. Turn adjustment counter-clockwise until SIGNAL LEVEL light goes out, then turn slowly clockwise until light just comes on.

SECTION 5

PARTS LISTS AND SCHEMATIC DIAGRAMS

5.01 This section includes the parts lists,
component identification drawings and
the schematic diagrams of the Preselector.

Model 304B Part List

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Preselector			
	Front Panel Assembly	7003-0059	Cushman	
	Front Panel	C2800-0078	Cushman	
	SWITCHES			
S1	Toggle, 5PDT	1850-0008	C&K Co.	#7101
S2	Toggle, 3PDT	1850-0007	Alco	MST-305D
	JACKS			
J1	Conn, RF W/Astro Plate	2536-0025	Amphenol	83-798
J2	Jack, 2 Conductor, Open Ckt. Audio	2586-0006	Switchcraft	#111
	P. C. Board Assembly 304B	7001-0184	Cushman	
	P. C. Board	1780-0371	Cushman	
	CAPACITORS			
C1	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Mica, 820pF, $\pm$ 5%, 300V	1002-0039	Elmenco	DM15-F-821J
C3	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Mica, 820pF, $\pm$ 5%, 300V	1002-0039	Elmenco	DM15-F-821J
C5	Mica, 180pF, $\pm$ 5%, 500V	1002-0005	Elmenco	DM15-F-181J
C6	Mica, 820pF, $\pm$ 5%, 300V	1002-0039	Elmenco	DM15-F-821J
C7	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Mica, 180pF, $\pm$ 5%, 500V	1002-0005	Elmenco	DM15-F-181J
C10	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C11	Mica, 820pF, $\pm$ 5%, 300V	1002-0039	Elmenco	DM15-F-821J
C12	Mica, 820pF, $\pm$ 5%, 300V	1002-0039	Elmenco	DM15-F-821J
C13	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C15	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C16	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C17	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C18	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C19	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C20	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C21	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C22	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C23	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C24	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C25	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C26	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Mica, 390pF, $\pm$ 5%, 500V	1002-0033	Elmenco	DM15-F-391J
C28	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C30	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C33	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C34	Mica, 820pF, $\pm$ 5%, 300V	1002-0039	Elmenco	DM15-F-821J
C35	Mica, 820pF, $\pm$ 5%, 300V	1002-0039	Elmenco	DM15-F-821J

Model 304B Part List (continued)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C36	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C37	Mica, 390pF, $\pm$ 5%, 500V	1002-0033	Elmenco	DM15-F-391J
C38	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C39	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C40	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C41	Mica, 22pF, $\pm$ 5%, 500V	1002-0023	Elmenco	DM15-C-220J
C42	Mica, 390pF, $\pm$ 5%, 500V	1002-0033	Elmenco	DM15-F-391J
C43	Mica, 39pF, $\pm$ 5%, 500V	1002-0018	Elmenco	DM15-E-390J
C44	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C45	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C46	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C47	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C48	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C49	Mica, 390pF, $\pm$ 5%, 500V	1002-0033	Elmenco	DM15-F-391J
C50	Mica, 39pF, $\pm$ 5%, 500V	1002-0018	Elmenco	DM15-E-390J
C51	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C52	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C53	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C54	Mica, 22pF, $\pm$ 5%, 500V	1002-0023	Elmenco	DM15-C-220J
C55	Mica, 390pF, $\pm$ 5%, 500V	1002-0033	Elmenco	DM15-F-391J
C56	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C57	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C58	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C59	Mica, 22pF, $\pm$ 5%, 500V	1002-0023	Elmenco	DM15-C-220J
C60	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C61	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C62	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C63	Mica, 100pF, $\pm$ 2%, 500V	1002-0050	Elmenco	DM15-F-101G
C64	Mica, 100pF, $\pm$ 2%, 500V	1002-0050	Elmenco	DM15-F-101G
C65	Mica, 100pF, $\pm$ 2%, 500V	1002-0050	Elmenco	DM15-F-101G
C66	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C67	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C68	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C69	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C70	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C71	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C72	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C73	Cer, 0.002 μ F, $\pm$ 20%, 500V	1005-0003	Erie	831060Z5U00202M
C74	Poly, 0.68 μ F, $\pm$ 10%, 100V	1008-0039	Electrocube	625B1B684K
C75	Polyester Film, 0.1 μ F, $\pm$ 10%, 100V	1008-0031	Sprague	225P10491
C76	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C77	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C78	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C79	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C80	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C81	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C82	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C83	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C84	Air, Variable, 3 Section, 8.1-117.5 pF, Trimmer, 2-15pF	1000-0005	Cushman	
C85	Cer, 0.05 μ F, +80%-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z

Model 304B Part List (continued)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
DIODES				
CR1	Si, MPN 3401	1281-0050	Motorola	MPN 3401
CR2	Si, MPN 3401	1281-0050	Motorola	MPN 3401
CR3	Diode, HPA-2800	1283-0001	HPA	H-P5082-2800
CR4	Si, IN3064	1281-0013	Transitron	IN3064
CR5	Si, IN3064	1281-0013	Transitron	IN3064
CR6	Si, IN3064	1281-0013	Transitron	IN3064
CR7	Si, IN3064	1281-0013	Transitron	IN3064
CR8	Si, IN3064	1281-0013	Transitron	IN3064
CR9	Diode, HPA-2800	1283-0001	HPA	H-P5082-2800
CR10	Ge, G633	1282-0005	ITT	G633
CR11	Ge, G633	1282-0005	ITT	G633
INTEGRATED CIRCUITS				
IC1	RF Ampl, 8 Pin	2025-0012	RCA	CA3028A
IC2	RF Ampl, 8 Pin	2025-0012	RCA	CA3028A
COILS				
L1	Choke, 1.5 μ H, $\pm$ 10%	1585-0038	Delevan	1537-16
L2	Choke, 1.5 μ H, $\pm$ 10%	1585-0038	Delevan	1537-16
L3	Var, 0.33-0.45 μ H, 5 Turn	D7050-0023	Cushman	#28, Black
L4	RF Choke, 680 μ H, $\pm$ 5%	1585-0023	Delevan	2500-20
L5	RF Choke, 15 μ H, $\pm$ 10%	1585-0034	Delevan	1537-40
L6	Var, 0.37-0.39 μ H, 5 1/4 Turn	D7050-0024	Cushman	
L7	RF Choke, 680 μ H, $\pm$ 5%	1585-0023	Delevan	2500-20
L8	RF Choke, 15 μ H, $\pm$ 10%	1585-0034	Delevan	1537-40
L9	Var 0.37-0.39 μ H, 5 1/4 Turn	D7050-0024	Cushman	
L10	RF Choke, 15 μ H $\pm$ 10%	1585-0034	Delevan	1537-40
L11	Var, 0.5-0.75 μ H, 8 Turn	1596-0011	Cushman	
L12	Choke, 100 μ H	1585-0017	Miller	9210-76
L13	Var, 0.5-0.75 μ H, 8 Turn	1596-0011	Cushman	
L14	Var, 0.5-0.75 μ H, 8 Turn	1596-0011	Cushman	
L15	Choke, 100 μ H	1585-0017	Miller	9210-76
L16	Var, 0.5-0.75 μ H, 8 Turn	1596-0011	Cushman	
L17	Var, 0.5-0.75 μ H, 8 Turn	1596-0011	Cushman	
L18	Choke, 100 μ H	1585-0017	Miller	9210-76
L19	Var, 0.5-0.75 μ H, 8 Turn	1596-0011	Cushman	
L20	RF Choke, 12 μ H, $\pm$ 10%	1585-0011	Delevan	1537-38
L21	RF Choke, 15 μ H, $\pm$ 10%	1585-0034	Delevan	1537-40
L22	Choke, 100 μ H	1585-0017	Miller	9210-76
L23	Choke, 100 μ H	1585-0017	Miller	9210-76
L24	RF Choke, 15 μ H, $\pm$ 10%	1585-0034	Delevan	1537-40
L25	RF Choke, 15 μ H, $\pm$ 10%	1585-0034	Delevan	1537-40
TRANSISTORS				
Q1	Mos/FET, Dual Gate, N Channel	1272-0028	RCA	3N140
Q2	Mos/FET, Dual Gate, N Channel	1272-0028	RCA	3N140
Q3	Mos/FET, Dual Gate, N Channel	1272-0028	RCA	3N140
Q4	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q5	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563

Model 304B Part List (continued)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
Q6	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q7	Si, PNP, TIS-37	1271-0003	T. I.	TIS-37
Q8	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q9	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q10	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q11	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q12	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
RESISTORS				
R1	Comp, 51 Ω , $\pm 5\%$, 1/4W	1066-5105	Allen-Bradley	CB 5105
R2	Comp, 39k, $\pm 5\%$, 1/4W	1066-3935	Allen-Bradley	CB 3935
R3	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R4	Comp, 100k, $\pm 5\%$, 1/4W	1066-1045	Allen-Bradley	CB 1045
R5	Comp, 51 Ω , $\pm 5\%$, 1/4W	1066-5105	Allen-Bradley	CB 5105
R6	Comp, 47k, $\pm 5\%$, 1/4W	1066-4735	Allen-Bradley	CB 4735
R7	Comp, 1.5k, $\pm 5\%$, 1/4W	1066-1525	Allen-Bradley	CB 1525
R8	Comp, 270 Ω , $\pm 5\%$, 1/4W	1066-2715	Allen-Bradley	CB 2715
R9	Comp, 51 Ω , $\pm 5\%$, 1/4W	1066-5105	Allen-Bradley	CB 5105
R10	Comp, 47k, $\pm 5\%$, 1/4W	1066-4735	Allen-Bradley	CB 4735
R11	Comp, 1.5k, $\pm 5\%$, 1/4W	1066-1525	Allen-Bradley	CB 1525
R12	Comp, 270 Ω , $\pm 5\%$, 1/4W	1066-2715	Allen-Bradley	CB 2715
R13	Comp, 150k, $\pm 5\%$, 1/4W	1066-1545	Allen-Bradley	CB 1545
R14	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R15	Comp, 270 Ω , $\pm 5\%$, 1/4W	1066-2715	Allen-Bradley	CB 2715
R16	Comp, 1k, $\pm 5\%$, 1/4W	1066-1025	Allen-Bradley	CB 1025
R17	Comp, 8.2k, $\pm 5\%$, 1/4W	1066-8225	Allen-Bradley	CB 8225
R18	Comp, 1k, $\pm 5\%$, 1/4W	1066-1025	Allen-Bradley	CB 1025
R19	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R20	Comp, 1k, $\pm 5\%$, 1/4W	1066-1025	Allen-Bradley	CB 1025
R21	Comp, 8.2k, $\pm 5\%$, 1/4W	1066-8225	Allen-Bradley	CB 8225
R22	Comp, 33k, $\pm 5\%$, 1/4W	1066-3335	Allen-Bradley	CB 3335
R23	Comp, 12k, $\pm 5\%$, 1/4W	1066-1235	Allen-Bradley	CB 1235
R24	Comp, 5.6k, $\pm 5\%$, 1/4W	1066-5625	Allen-Bradley	CB 5625
R25	Comp, 5.6k, $\pm 5\%$, 1/4W	1066-5625	Allen-Bradley	CB 5625
R26	Comp, 1k, $\pm 5\%$, 1/4W	1066-1025	Allen-Bradley	CB 1025
R27	Comp, 1.1k, $\pm 5\%$, 1/4W	1066-1125	Allen-Bradley	CB 1125
R28	Comp, 240 Ω , $\pm 5\%$, 1/4W	1066-2415	Allen-Bradley	CB 2415
R29	Comp, 12k, $\pm 5\%$, 1/4W	1066-1235	Allen-Bradley	CB 1235
R30	Comp, 12k, $\pm 5\%$, 1/4W	1066-1235	Allen-Bradley	CB 1235
R31	Thermistor, 1k Ω	1253-0002	Veco	31E2
R32	Comp, 820 Ω , $\pm 5\%$, 1/4W	1066-8215	Allen-Bradley	CB 8215
R33	Comp, 100 Ω , $\pm 5\%$, 1/4W	1066-1015	Allen-Bradley	CB 1015
R34	Comp, 12k, $\pm 5\%$, 1/4W	1066-1235	Allen-Bradley	CB 1235
R35	Comp, FSV, $\pm 5\%$, 1/4W	1066-xxxx		
R36	Comp, 12k, $\pm 5\%$, 1/4W	1066-1235	Allen-Bradley	CB 1235
R37	Comp, 10k, $\pm 5\%$, 1/4W	1066-1035	Allen-Bradley	CB 1035
R38	Comp, 5.6k, $\pm 5\%$, 1/4W	1066-5625	Allen-Bradley	CB 5625
R39	Comp, 100 Ω , $\pm 5\%$, 1/4W	1066-1015	Allen-Bradley	CB 1015
R40	Comp, 2.7k, $\pm 5\%$, 1/4W	1066-2725	Allen-Bradley	CB 2725

Model 304B Part List (continued)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R41	Comp, 10 Ω , $\pm 5\%$, 1/4W	1066-1005	Allen-Bradley	CB 1005
R42	Comp, 33k, $\pm 5\%$, 1/4W	1066-3335	Allen-Bradley	CB 3335
R43	Comp, 39k, $\pm 5\%$, 1/4W	1066-3935	Allen-Bradley	CB 3935
R44	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R45	Comp, 680 Ω , $\pm 5\%$, 1/4W	1066-6815	Allen-Bradley	CB 6815
R46	Comp, 2.2k, $\pm 5\%$, 1/4W	1066-2225	Allen-Bradley	CB 2225
R47	Comp, 470 Ω , $\pm 5\%$, 1/4W	1066-4715	Allen-Bradley	CB 4715
R48	Comp, 1k, $\pm 5\%$, 1/4W	1066-1025	Allen-Bradley	CB 1025
R49	Comp, 1.5k, $\pm 5\%$, 1/4W	1066-1525	Allen-Bradley	CB 1525
R50	Comp, 43 Ω , $\pm 5\%$, 1/4W	1066-4305	Allen-Bradley	CB 4305
R51	Comp, 1.8k, $\pm 5\%$, 1/4W	1066-1825	Allen-Bradley	CB 1825
R52	Comp, 1.5k, $\pm 5\%$, 1/4W	1066-1525	Allen-Bradley	CB 1525
R53	Comp, 470 Ω , $\pm 5\%$, 1/4W	1066-4715	Allen-Bradley	CB 4715
R54	Comp, 1k, $\pm 5\%$, 1/4W	1066-1025	Allen-Bradley	CB 1025
R55	Comp, 43 Ω , $\pm 5\%$, 1/4W	1066-4305	Allen-Bradley	CB 4305
R56	Comp, 1.8k, $\pm 5\%$, 1/4W	1066-1825	Allen-Bradley	CB 1825
R57	Comp, 680 Ω , $\pm 5\%$, 1/4W	1066-6815	Allen-Bradley	CB 6815
R58	Comp, 1.5k, $\pm 5\%$, 1/4W	1066-1525	Allen-Bradley	CB 1525
R59	Comp, 270 Ω , $\pm 5\%$, 1/4W	1066-2715	Allen-Bradley	CB 2715
R60	Comp, 82k, $\pm 5\%$, 1/4W	1066-8235	Allen-Bradley	CB 8235
R61	Comp, 100k, $\pm 5\%$, 1/4W	1066-1045	Allen-Bradley	CB 1045
R62	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R63	Comp, 10k, $\pm 5\%$, 1/4W	1066-1035	Allen-Bradley	CB 1035
R64	Comp, 22k, $\pm 5\%$, 1/4W	1066-2235	Allen-Bradley	CB 2235
R65	Comp, 1.8k, $\pm 5\%$, 1/4W	1066-1825	Allen-Bradley	CB 1825
R66	Comp, 1.8k, $\pm 5\%$, 1/4W	1066-1825	Allen-Bradley	CB 1825
R67	Cer, Pot, 500 Ω , $\pm 10\%$, 3/4W	1215-0011	Helitrim	#89WR
R68	Comp, 1.2k, $\pm 5\%$, 1/4W	1066-1225	Allen-Bradley	CB 1225
R69	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R70	Comp, 390 Ω , $\pm 5\%$, 1/4W	1066-3915	Allen-Bradley	CB 3915
R71	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R72	Comp, 330 Ω , $\pm 5\%$, 1/4W	1066-3315	Allen-Bradley	CB 3315
R73	Comp, 2.2k, $\pm 5\%$, 1/4W	1066-2225	Allen-Bradley	CB 2225
R74	Comp, 2.2k, $\pm 5\%$, 1/4W	1066-2225	Allen-Bradley	CB 2225
R75	Comp, 5.6k, $\pm 5\%$, 1/4W	1066-5625	Allen-Bradley	CB 5625
R76	Comp, 220 Ω , $\pm 5\%$, 1/4W	1066-2215	Allen-Bradley	CB 2215
R77	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R78	Comp, 470 Ω , $\pm 5\%$, 1/4W	1066-4715	Allen-Bradley	CB 4715
R79	Comp, 4.7k, $\pm 5\%$, 1/4W	1066-4725	Allen-Bradley	CB 4725
R80	Comp, 3.9k, $\pm 5\%$, 1/4W	1066-3925	Allen-Bradley	CB 3925
R81	Cer, Pot, 500 Ω , $\pm 10\%$, 3/4W	1215-0011	Helitrim	#89WR
R82	Comp, 2.2k, $\pm 5\%$, 1/4W	1066-2225	Allen-Bradley	CB 2225
R83	Comp, 820 Ω , $\pm 5\%$, 1/4W	1066-8215	Allen-Bradley	CB 8215
R84	Comp, 10k, $\pm 5\%$, 1/4W	1066-1035	Allen-Bradley	CB 1035
R85	Comp, 2.2k, $\pm 5\%$, 1/4W	1066-2225	Allen-Bradley	CB 2225
R86	Comp, 56 Ω , $\pm 5\%$, 1/4W	1066-5605	Allen-Bradley	CB 5605
R87	Comp, 10 Ω , $\pm 5\%$, 1/4W	1066-1005	Allen-Bradley	CB 1005
R88	Comp, 120 Ω , $\pm 5\%$, 1/4W	1066-1215	Allen-Bradley	CB 1215

Model 304B Part List (continued)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	CRYSTALS			
X1	Filter, 10.0 MHz-22.0 kHz	B1040-0012	Cushman	
	Rear Panel Assembly	7003-0060	Cushman	
	Back Plate	C2245-0012	Cushman	
P1	Connector, 24 Pin, Male	2535-0019	Amphenol	26-159-24

TOP

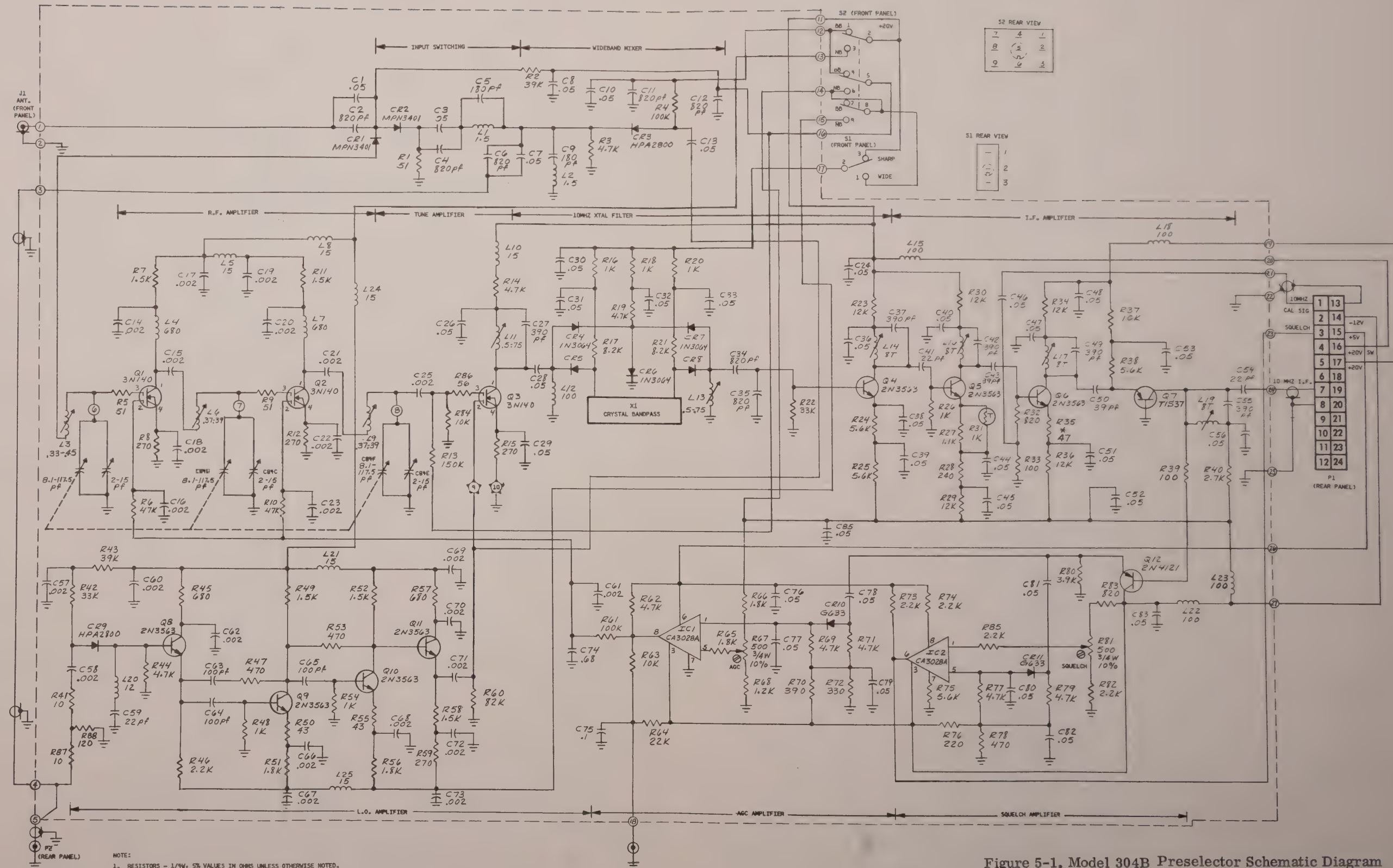
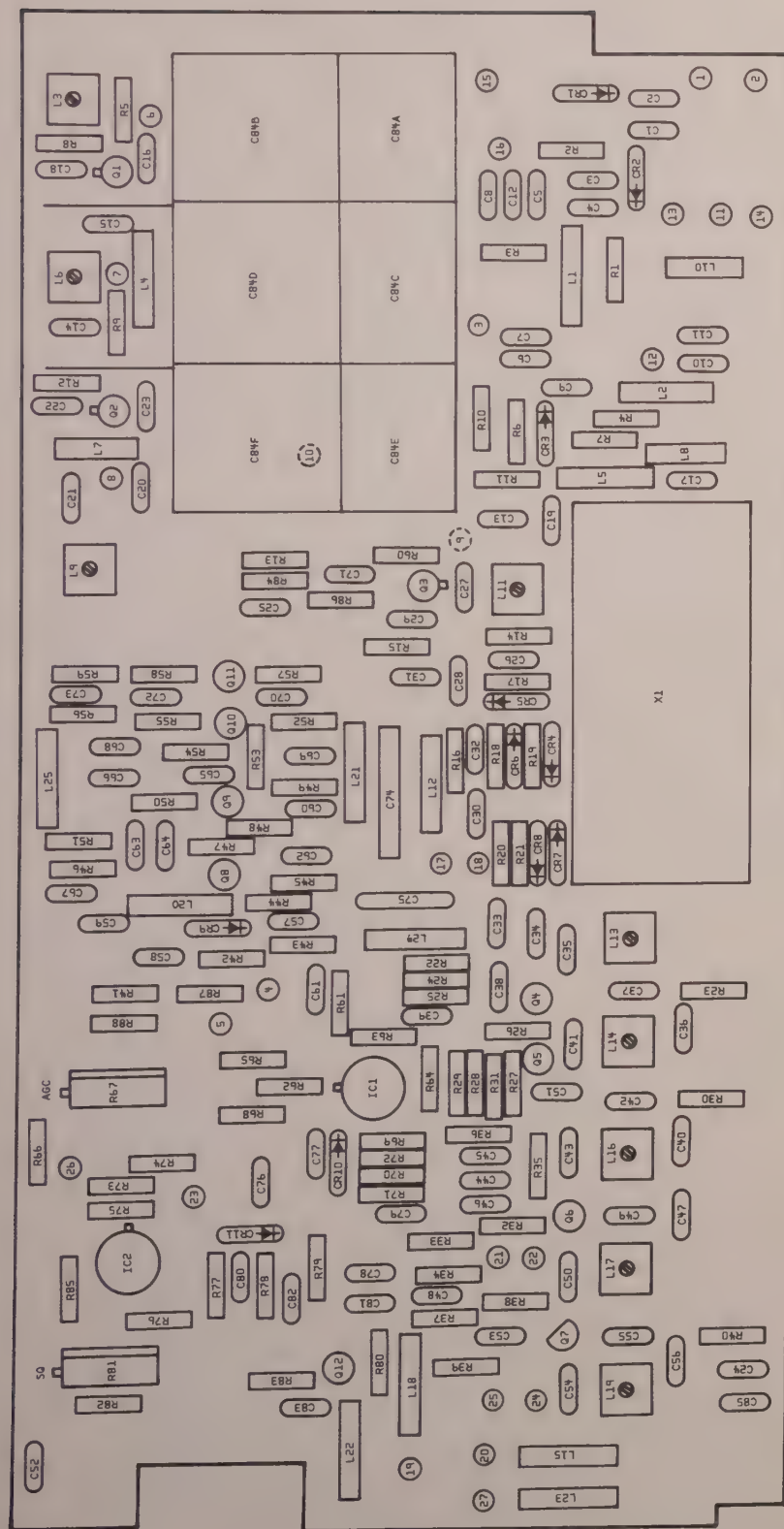


Figure 5-1. Model 304B Pres-selector Schematic Diagram

DEAR CUSTOMER:

Every effort has been made to ensure the accuracy of this manual. If an error is discovered please notify us on the postpaid cards attached.

Please indicate where the error has been made. To improve future manuals your comments are requested.

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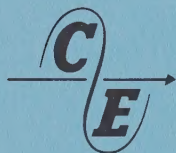
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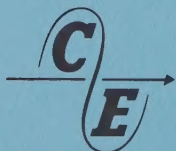
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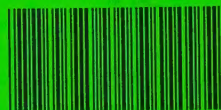
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